Claims

[c1] 1. A method for separating the polyolefin component from the polyamide component of a post-consumer or post-industrial commingled waste containing both polyolefin and polyamide polymeric components comprising: (a) admixing the commingled waste with an ester solvent composition; (b) heating the admixture to a temperature above the melting temperature of the polyolefin component sufficient to dissolve at least a portion of the polyamide component of the commingled waste in the ester solvent composition and form a separate immiscible molten polyolefin phase; (c) separating the ester solvent composition containing dissolved polyamide from the immiscible polyolefin phase.

[c2] 2. The method of claim 1 wherein in step (a) the ester solvent composition comprises about 98% to about 30% by weight of the admixture.

[c3] 3. The method of claim 1 wherein in step (a) the commingled waste is composed predominantly of Nylon 6 fibers commingled with polypropylene fibers.

[c4] 4. The method of claim 1 wherein in step (a) the commingled waste is composed predominantly of Nylon

6,6 fibers commingled with polypropylene fibers.

[c5] 5. The method of claim 1 wherein in step (b) the admixture is heated to a temperature above about 220 degrees Celsius to dissolve Nylon 6,6.

[c6] 6. The method of claim 1 wherein in step (a) the ester solvent composition is predominantly ethylene carbonate, propylene carbonate, butylene carbonate, or combinations thereof.

[c7] 7. The method of claim 1 wherein in step (a) the ester solvent composition is predominantly propylene carbonate.

[c8] 8. The method of claim 1 wherein in step (a) the ester solvent composition contains a cyclic ester and decomposition products of poly(ethylene terephthalate) formed by heating poly(ethylene terephthalate) in the presence of a cyclic ester to a temperature above about 215 degrees Celsius.

[c9] 9.The method of claim 8 wherein the ester solvent composition contains propylene carbonate and decomposition products of poly(ethylene terephthalate) formed by heating poly(ethylene terephthalate) in the presence of propylene carbonate to a temperature above about 215 degrees Celsius.

[c10] 10.The method of claim 1 wherein in step (b) the ester solvent composition contains dissolved polyamide polymer and suspended undissolved polyamide polymer separate from the immiscible molten polyolefin phase.

[c11] 11. A method for separating the Nylon 6 polymer component from the polyolefin polymer component of commingled post-consumer carpet waste containing polyolefin and Nylon 6 polyamide fibers comprising: (a) admixing the commingled carpet waste with an ester solvent composition containing at least one cyclic ester; (b) heating the admixture to a temperature above about 190 degrees Celsius for a period of at least about 5 minutes to dissolve at least a portion of the Nylon 6 fibers in the ester solvent composition and form a separate discrete molten polyolefin phase; (c) separating the discrete molten polyolefin phase from the ester solvent composition phase by skimming, filtration, centrifugation, or combinations thereof; (d) cooling the ester solvent composition to a temperature below about 150 degrees Celsius to precipitate dissolved Nylon 6 polymer; and (e) separating the cooled ester solvent composition from Nylon 6 polymer by electrophoresis, sedimentation, flocculation, filtration, centrifugation, or combinations thereof.

[c12] 12. The method of claim 11 wherein in step (a) the ester

solvent composition containing at least one cyclic ester is propylene carbonate, ethylene carbonate, butylene carbonate, or mixtures thereof.

[c13] 13. The method of claim 11 wherein in step (b) the admixture is heated to a temperature above about 200 degrees Celsius.

[c14] 14. The method of claim 11 wherein in step (a) the commingled carpet waste constitutes between 2% and 50% by weight of the admixture.

[c15] 15. The method of claim 11 wherein the post-consumer carpet waste containing polyolefin and Nylon 6 polyamide fibers contains polypropylene fibers derived from the carpet backing structure.

[c16] 16. The method of claim 15 wherein the post-consumer carpet waste containing polyolefin and Nylon 6 fibers denotes the fibrous components of a pre-processed waste which process comprises physically sorting post-consumer waste to obtain a sorted carpet waste composed exclusively of carpet pieces containing only Nylon 6 face fibers, then separating the fibrous components of the sorted carpet waste from dirt and non-fibrous carpet backing components by shredding, cutting, grinding, washing, screening, air elutriation, particle size separation

techniques, and combinations thereof.

[c17] 17. A method for separating the Nylon 6,6 polyamide polymer component from the polyolefin polymer component of commingled post-consumer carpet waste containing polyolefin and Nylon 6,6 fibers comprising: (a) admixing the commingled carpet waste with an ester solvent composition containing at least one cyclic ester; (b) heating the admixture to a temperature above about 215 degrees Celsius for a period of at least about 5 minutes to dissolve at least a portion of the Nylon 6 fibers in the ester solvent composition and form a separate discrete molten polyolefin phase; (c) separating the discrete molten polyolefin phase from the ester solvent composition phase by skimming, filtration, centrifugation, or combinations thereof; (d) cooling the ester solvent composition to a temperature below about 170 degrees Celsius to precipitate dissolved Nylon 6,6 polymer; and (e) separating the cooled ester solvent composition from Nylon 6,6 polymer by electrophoresis, sedimentation, flocculation, filtration, centrifugation, or combinations thereof.

[c18] 18. The method of claim 17 wherein in step (a) the ester solvent composition is propylene carbonate, ethylene carbonate, butylene carbonate, or mixtures thereof.

[c19] 19. The method of claim 17 wherein in step (b) the admixture is held at a temperature above about 215 degrees Celsius for a period of at least about 15 minutes.

[c20] 20. The method of claim 17 wherein in step (d) the ester solvent composition is cooled to a temperature below about 100 degrees Celsius.

[c21] 21. The method of claim 17 wherein the post-consumer carpet waste containing polyolefin and Nylon 6,6 polyamide fibers contains polypropylene fibers derived from the carpet backing structure.

[c22] 22. The method of claim 21 wherein the post-consumer carpet waste containing polyolefin and Nylon 6,6 fibers denotes the fibrous component of a pre-processed waste which process comprises physically sorting post-consumer waste to obtain a sorted carpet waste composed exclusively of carpet pieces containing only Nylon 6,6 face fibers, separating the fibrous component of the sorted carpet waste from dirt and non-fibrous carpet backing components by shredding, cutting, grinding, washing, screening, air elutriation, particle size separation techniques, and combinations thereof.

[c23] 23. The method of claim 17 wherein in step (a) the ester solvent composition is propylene carbonate.

[c24] 24. The method of claim 1 wherein in step (c) the ester solvent composition containing dissolved polyamide and the immiscible polyolefin phase are cooled prior to separation to form an ester composition containing suspended polyamide and a separate solid polyolefin mass.